

The Development of the Polish Chemical Industry

STAT

Przemysl Chemiczny, Vol VI, No6,
Polish, mo per, Jun 50

STAT

STAT

DEVELOPMENT OF THE POLISH CHEMICAL INDUSTRY
AND THE PART PLAYED IN IT BY FOREIGN CAPITAL

(Materials in Preparation for the First Congress of
Polish Science)

T. Zamoyski

(Abstract)

The conditions of the development of the Polish chemical industry before World War I and in the period between the two World wars. The part played by foreign capital and its influence on the Polish chemical industry, with particular reference to the production of soda, sulfuric acid, coal derivatives, intermediate organic products, dyes, pharmaceutical products, fats, artificial fibers, and matches. The state of the chemical industry after the war and at the present time.

1822 is generally recognized as the year in which the Polish chemical industry was begun, with its first deliberate industrial application of chemical processes.

The Warsaw Chemical Products Factory, owned by Kijewski and Hirszman, was founded in that year. This factory produced sulfuric acid through the oxidation of sulfur, a method which

was not changed until 1905).

Until World War I, the lines of development of the chemical industry were determined by the economic policies of the three occupying powers. These did not permit serious development of the Polish chemical industry. As a result, the area occupied by Austria contained no more than two sulfuric acid factories, one soda factory, and several small superphosphate factories. The area occupied by Germany contained only a few chemical plants in the vicinities of Poznan, Bydgoszcz, and Inowroclaw, and several factories of intermediate products (polfabrykaty) such as sulfuric acid and coal pitch with its simplest distillates, which were indispensable for the most basic economic requirements of Gorny Slask. The chemical industry was best developed in the Krolestwo Kongresowe. Even here, however, certain contradictions could be found, such as the prohibition against the production of explosives, or the necessity for bringing salt to Sosnowiec from the distant Zaglenie Doniecke, instead of from the nearby Wieliczka.

The war activities of 1914 and 1915 further aggravated the situation; for instance, the destruction of the modern sulfuric acid and superphosphate factory in Lowicz. This historical background influenced the development and location of the Polish chemical industry in the period between the two World wars.

Before 1914, the capital invested in the chemical indus-

try was mostly of foreign origin, coming principally from Germany, Belgium, and France. An enterprise such as the dye factory in Zgierz near Lodz (later known as the Boruta Factory), established by a group of Polish chemists headed by Sniechowski and Hordliczka, constituted a rarity.

There were no important developments in the Polish chemical industry during the decade following World War I.

It was during the second decade, immediately preceding the outbreak of World War II, that a number of new developments took place. Among these was the construction of large new chemical plants for the production of sulfuric acid, superphosphates, and synthetic nitrogen compounds. The Chodakow Rayon Factory and the Winnica Dye Factory near Warsaw were put into operation. In addition, previously-existing plants were expanded and modernized; for instance, the Ligoza Plastics Factory, the Boruta Dyes and Intermediate Products Factory, and the Tomaszow Synthetic Fibers and Carbon Sulfide Factory.

The state of the Polish chemical industry on the eve of the War is represented by the figures below. These are the 1938 production figures for key products of the chemical industry (in round numbers):

sulfuric acid	tons 196,000 (computed on basis of 100%)
superphosphates	225,000
sodium carbonate anhydride	82,000

caustic soda	tons 30,000	
nitrogen compounds	53,500	(bound nitro- gen)
crude coal pitch	150,000	
crude benzol	41,500	
synthetic organic dyes	2,000	
zinc white	13,000	
synthetic fibers	10,000	

To evaluate properly the significance of these figures, they must be compared with world production figures; this comparison will indicate the role played by Polish industry on a world-wide scale.

	World production in 1938 (thousand tons)	Share of Po- lish produc- tion (%)
sulfuric acid	16,000	1.25
superphosphates	15,000	1.45
caustic soda	4,500	1.85
nitrogen compounds	2,800	1.85
benzol	1,500	2.7
synthetic organic dyes	200	1.0
synthetic fibers	925	1.1

The above comparisons indicate that the Polish chemical industry did not play an important role in world production dur-

ing the prewar period. It amounted to about 1.5 percent or even less, considering the fact that the world production figures usually do not include the large output of the USSR.

The full production capacities of many Polish plants were not utilized in the prewar period. Typically, superphosphate plants with a capacity of 850,000 tons a year produced little more than 25 percent of their potential output. The reasons for this were two-fold: on the one hand, there was a discrepancy between industrial and agricultural prices, and a generally low consumption of industrial products, especially in rural areas among the impoverished peasants; on the other hand, the economic policies at that time tended to popularize the use of nitrogen fertilizers in preference to phosphorus fertilizers. Sulfuric acid plants with a production capacity of about 300,000 tons of 100 percent acid utilized about two-thirds of their capacity.

The amount of invested capital in the chemical industry before World War II may be estimated to have been about 1.5 billion prewar zlotys. The number of employees totaled 49,000 persons, which means that the invested capital amounted to 31,000 zlotys per employee.

This constitutes a rather low figure, considering that the chemical industry characteristically employs few workers and has expensive factory equipment.

The corresponding figure for adjacent Czechoslovakia was

35,000 zlotys, and in the industrialized countries it was much higher.

The amount of foreign capital invested in Polish industry can be computed only with respect to joint-stock companies (spolki akcyjne) and incorporated companies (spolki o ograniczonej odpowiedzialnosci), since not other types of business are covered by statistics. This gives a fairly accurate picture so far as capital stock, founding (zakladowe) capital, and reserve capital are concerned. No similar computation can be made concerning capital investment, since capital stock was frequently much lower than the capital investment because of considerations concerning taxes, transfers, and many others typical of a capitalist economy.

Industrial Chemical Joint-Stock Companies

Located in Poland

Number of companies	105
Total capital	288.2 mill. zlotys
Of this, founding capital	238.7 " "
Number of companies with foreign capital	58
Total capital	238.1 mill. zlotys
Of this, founding capital	171.4 " "
Percentage of foreign capital:	
In all businesses	59.5%
In business with foreign participation	72.0%

Incorporated Companies of the Chemical Industry

Number of companies with foreign capital	11
Total capital	49.4 mill.zlotys
Foreign capital included in above figure	43.1 " "
Expressed as a percentage	87.2%

In comparison, the entire prewar industry included 1,100 joint-stock companies with a capital of 3,911 million zlotys, of which 2,447 million zlotys belonged to 427 companies containing foreign capital; the foreign capital constituted 38.8 percent of the capital of all the businesses with foreign participation.

Among the incorporated companies, 89 contained foreign capital. These had a capital of 252.4 million zlotys, out of which 226.4 million zlotys, or 89.7 percent was foreign capital.

The amount of foreign credit utilized by the privately-owned chemical industries was estimated to be 138 million zlotys.

An illuminating comparison may be made of the various ways in which foreign capital participated in Polish industry in 1935. The following figures include all branches of privately-owned industry:

	million zlotys
short-term bank credits	276
industrial credits	1,154
commercial credits	95
Portion of capital belonging to Polish enterprises	1,692
credits for foreign enterprises operating in Poland	301
long-term credits	273
Total	<hr/> 3,791

The above figures point up the typical part played by short-term credits, which amounted to about 40 percent of the total. This constituted a very high percentage, which was against the best national interests, since such credits could be withdrawn with very short notice at the least appropriate moment.

It must be pointed out that there are also other less tangible and more concealed forms of foreign participation which, strictly speaking, amounted to sharing in profits. The chemical industry is a particularly fertile field for such practices, which may include payments for technical assistance, for production methods, for foreign trade-marks and patents, and for scientific or economic research. These are payments for intangibles, the value of which depends on the arbitrary estimate of those stockholders who control the largest number of shares.

This accounts for the relatively low net profits, or some-

times even losses, shown by enterprises which were in reality profitable, and at times even very attractive to the foreign investor.

Generally, the chemical industry did show profits. In 1936, 78 joint-stock companies showed a total profit of 16.4 million zlotys, while 23 companies showed a total loss of 3.7 million zlotys. Hence, profits exceeded losses by 12.7 million zlotys, which provided about a 5 percent rate of interest.

It is interesting to see to what extent, under prewar conditions, the development of certain branches of the Polish chemical industry depended on the availability of foreign markets.

Soda

The Solvay concern, operating under the name Solvay Enterprises in Poland, played a decisive role in the production of soda in general, and in that of caustic soda particularly. Its organizational form was characteristically that of an incorporated company (partnership with limited liability), the largest business of this type in Poland, rather than in the form of a joint-stock business. The founding capital of 40 million zlotys belonged almost entirely to the Belgian Solvay concern. The Polish Solvay enterprises were vertically structured, and included a salt mine, a coal mine, two soda plants, and a cement-making plant.

The Belgian concern had a policy of opposing Polish exports of soda to nearby foreign markets, which were reserved for other Solvay enterprises. Hence there was no soda export during the prewar period. As is well known, soda has now become one of the main export articles of the Polish chemical industry. In the prewar period, production installations corresponded in size to the demands of the Polish market, and were not expanded beyond these requirements. There were no net profits until 1934, after which there was a slight excess of assets over liabilities.

According to the data published by engineer B. Barwinski (Przemysl Chemiczny No 12, 1949, page 529 forward), amortization costs on installations constituted 22 percent of the computed production costs of soda in the Solvay Enterprises in Poland. The 1939 sales price of soda was maintained above 207 zlotys per ton, while operating costs, including all depreciation (nakladowe), were 61 zlotys per ton on the basis of Barwinski's data. It may be inferred that with the modest net profits shown, the large difference between operating costs and selling price was absorbed in amortization, high payments to the Belgian concern for various technological or economic services, credit costs and similar expenses, as well as in excessive marketing and general expenses. For instance, the balance sheet for December 31, 1934 presents the following additional debits, in ^{and} above the 14.4 million zlotys of operating costs:

	million zlotys
administration costs	1.4
marketing costs	1.3
credit expenses	2.2
amortization	6.6
miscellaneous	0.6
	<hr/>
Total	12.1

Hence, 90 percent of the production costs were other than operating expenses, as shown above.

Sulfuric Acid

About two-thirds of the sulfuric acid was produced from zinc ores, and about one third from pyrites. All the zinc plants in which sulfuric acid was produced belonged to foreign capital.

The total capital of these enterprises cannot be ascribed to the chemical industry alone, since the concerns involved also comprised coal mines, zinc ore mines, metallurgical plants, brick-kilns, electric power stations, and similar enterprises.

The largest of all factories producing sulfuric acid from pyrites belonged to Belgian capital, namely, to the Union Chimique Beligique. Through the Societe Generale d'Industrie en Pologne, an organization created in Brussels specifically for this purpose, it owned about 90 percent of the stock of the Polish firm, which had a founding capital of seven million zlotys.

The sulfuric acid plants in which foreign capital participated formed a monopolistic sales organization, the United Distributors of Sulfuric Acid, located in Katowice.

In 1934, Polish state capital constructed and put into operation a modern sulfuric acid plant which utilized the contact method. This plant had a production capacity of 18,000 tons of 100 percent acid per year; it produced concentrated acids and oleum.

As is known, the sulfuric acid plants utilized only about two-thirds of their production capacity. This was due to the low level of superphosphate production in Poland, and to the lack of exports.

Coal Derivatives

Distillation of coal pitch derived from coke ovens took place in only one enterprise, located in Wielkie Hajduki and belonging to the United Coke Enterprises. This was a unique organizational form. The nine existing coke-oven enterprises were not independent businesses, but were each part of a larger mining or metallurgical business unit. These larger business enterprises created the incorporated United Coke Enterprises, which took charge of the distillation of pitch produced in all the ovens, as well as of impregnating enterprises and tar paper (tek-tura smolowa) factories.

In order to investigate the organization of the United Coke Enterprises with respect to capital, it is necessary to become acquainted with the interrelationships among the participating enterprises. The most important of these enterprises were:

The Rybnickie Coal Gwarectwo
 The Rudzkie Coal Gwarectwo
 The Pokog Metallurgical Enterprise
 The Gliwice O. S. Eisenbahnbedarfs A. G.

In all these enterprises, foreign capital had either partial or total interests. The Rybnicke Gwarectwo, with a capital of 50 million zlotys, was the property of the German Friedlander Fulsche family, and through it was connected with the Goldschmidt-Rothschild family. The Rudzkie Gwarectwo was owned by the German Ballestrem family, which in turn had interests in the Gliwice O. S. Eisenbahnbedarfs A. G., and in the Pokoj Metallurgical Enterprise. In these last two enterprises, however, the State Treasury owned 52 percent of the capital, which amounted to 50 million zlotys.

The remaining coke enterprises which distilled their pitch through the United Coke Enterprise belonged to the following business organizations: the Skarboferm, with a capital of 17.63 million zlotys, owned half by the State Treasury and half by French capital; the joint-stock enterprise Godula, with a capital of 18 million zlotys, owned by German families; and the United

Krolewska and Laura Metallurgical plants, with a capital of 84 million zlotys. This last enterprise fell under court supervision, and in the last few prewar years was included in the well-known operation of concentrating the Slask metallurgical industry (Common Interest). The capital and familial interrelationships of the Polish and German Gorny Slask industries produced a situation in which, in the area of pitch distillation, Polish industry was economically related to the German industry. In 1938, the decision was made to construct another coal pitch distillery in addition to the one in Wielkie Hajduki. This was to be located in the Central Industrial Okreg (COP). The outbreak of the war prevented this plan from being carried out.

Intermediate Products and Organic Dyes

There were four factories which were of decisive importance in the area of organic dye production. These were: the Boruta joint-stock enterprise, with a capital of 3.75 million zlotys and almost entirely state-owned through the National Economic Bank; the Wola Krzysztopolska Chemical Factory, owned by Polish capital represented by the Piotrkow industrialists, the Szpilfogels; the Pabianicka Industrial Chemical Joint-Stock Enterprise, with a capital of 4 million zlotys, owned in its entirety by the well-known Swiss firm Ciba of Basel; the Winnica joint-stock enterprise near Warsaw, with a capital of 2 million, represented entirely by the French concern Etablissment Kuhlmann, but owned in half by Kuhlmann and in half by the German

I. G. Farbenindustrie A. G. concern.

The capital and ownership structure of the individual enterprises is of less importance, however, than their role in the production. Their 1938 production figures were as follows:

	tons of dyes
Boruta	587
Pabienice	612
Winnica	392
Wola Krzysztopolska	290
Others	75
Total	1,956

During this period, 344 tons of dyes were imported, so that Polish production satisfied about 85 percent of the demand. However, in terms of monetary value, Polish production amounted to 22.3 million zlotys, and the imports to 14 million zlotys, which meant that Polish production satisfied only 62 percent of the requirements in those terms.

The mutual relationships between the foreign cartel and the Polish industrial group were regulated by an agreement which was scarcely known and was never mentioned in published statistics or reports. This agreement was brought into the open by Dr. M. Russocki (Przemysl Chemiczny No 12, 1947, page 468 forward). The agreement gives a very different picture of the actual extent of foreign participation and influence on the Polish dye

market. The market was divided from the point of view of capital, rather than geographic location. In other words, it was not a matter of agreeing on the relative proportion of imports as compared to domestic products used in satisfying the demands of the market, but rather of dividing the market between the Polish group and the foreign cartel, which represented its entire production, regardless of where the actual production process took place -- Poland, France, Switzerland, Germany, or anywhere else.

The cartel agreement for 1938 provided the foreign cartel with a 69 percent share of the market and the Polish group with a 31 percent share.

There was a continual struggle between the Polish group, primarily the Boruta enterprise, on the one hand, and the foreign cartel on the other. The cartel held the viewpoint that Poland should import unfinished organic products in a highly refined condition, requiring that they only be subjected to the final uncomplicated chemical or mechanical operations necessary to produce the finished dye. The Polish group, headed by the now deceased Pluzanski, Szeunert, and Krolweski, consistently demanded and actually realized at the Boruta plant a program of producing intermediate products. Just before the war this program reached the point where over 150 different compounds were under production; these covered a wide range and included, for instance, Acid H, Acid Gamma, naphthalene, benzene, and others.

Factories belonging to the foreign cartel bought, though reluctantly, Boruta's intermediate products, and even themselves undertook their production. For instance, Winnica, using the contact method, operated a technically perfect production process, making anthraquinone from crude anthracene.

The foreign cartel carried on their struggle against this, as well as against the undertaking of production of new dyes, most often by means of price reductions. As soon as a new production process would be initiated, there would be a drastic reduction in the price of the imported product, usually to a point below the Polish costs of production. Usually, the factories owned by the foreign cartel but located in Poland did not participate in this struggle. It was primarily the business representatives of the foreign producers who were active in this way. Since about 50 percent of the imported dyes came from Germany, the I. G. representatives played a dominant role.

The weapons used by the Polish side in this battle were prohibitions on importation and increased custom duties on intermediate products and on dyes. The Polish prewar customs had such a well-developed nomenclature on intermediate products that it almost amounted to a catalogue. Tariff protection was very strong and frequently amounted to 100 percent of the value.

Pharmaceutical products

Of the seven most important pharmaceutical enterprises, four

were almost entirely based on Polish capital, and three on foreign capital. To the first four belonged:

The joint-stock enterprise Motor and its related Motor-Alkaloida, with a capital of 1.2 million zlotys.

The joint-stock enterprise Magister Klawe, with a capital of 1.5 million zlotys.

The joint-stock enterprise Fr. Karpinski, with a capital of 0.6 million zlotys.

The joint-stock enterprise Ludwik Spiess and Son, with a capital of 9 million zlotys.

The latter was related in a special way to French capital. The firm L. Spiess and Son and the well-known French pharmaceutical firm Rhone-Poulenc S. A. created a third firm in which each had an equal share. This was the joint-stock enterprise Spiess-Rhone-Poulenc, Polish Branch (Specja Polska) with a capital of one million zlotys. This partnership was created for the purpose of manufacturing in Poland the French firm's preparations, and for collaborating in the French manufacture of preparations belonging to the Polish firm.

The principal contribution of the French firm was their method of preparing arseno-benzoles, and that of the Polish firm, their method of preparing inosite-phosphorus compounds.

In addition to the four firms mentioned, there were sev-

eral dozen small or medium-sized pharmaceutical chemical plants which operated on Polish capital.

The enterprises with exclusively foreign capital were as follows:

The Pabianicka Enterprise of the Chemical Industry (joint-stock concern), discussed in the section on dyes. It had a capital of 4 million zlotys, owned entirely by Swiss investors.

The joint-stock enterprise Roche, with a capital of 2 million zlotys, owned by Swiss investors.

The joint-stock enterprise Dr. A. Wander, with a capital of 2 million zlotys, owned by Swiss investors.

The policy of the foreign firms, as in the case of the dye industry, was to import highly refined intermediate products or even finished products, but in the form of chemicals rather than medications. This meant that they were imported under their chemical names in mass lots, and were then converted into pharmaceutical products with fancy names through mixing, diluting, dosing, packaging them appropriately, and giving them registered trade labels.

On the eve of the war the following important pharmaceutical compounds were entirely manufactured in Poland: inositol, phosphorus compounds, protein-silver compounds (bialkowo-srebrowe), barbiturates, salicylates, gold compounds, vitamins, hormones,

bismuth compounds, insulin, narcotic alkaloids, and sulfanilamides.

It is worth mentioning the struggle against I. G. which was waged and won by Polish industry (led by Motor with the now deceased F. Wieckowski) for the Polish production of acetylsalicylic acid (aspirin, motopirin), and the struggle with Roche for the production of narcotic alkaloids (morphine, codeine).

The Fat Industry

The Schicht-Lever joint-stock concern was the largest enterprise of the Polish fat industry. It was, in fact, the only enterprise of this type operating on such a large scale. It had a vertical type of organization which included oil plants, laundry and toilet soap factories, margarine and edible fats factories, and fat-solidifying plants. The firm's capital of 15 million zlotys belonged to the world-wide fat concern Unilever. It is interesting to note the way in which Schicht's Polish enterprises were taken over by Unilever. In 1919, through complicated stock purchases and exchanges, 50 percent of the stock of the central and eastern European enterprises of the Austro-Czech Schicht concern came to belong to the Dutch N. V. Margarine Unie concern. This enterprise arose through the merger of the two Dutch firms, Berghs and Jurgens. In 1929, through the Swiss Limmat holding company of Zurich, Margarine Unie acquired the remaining 50 percent of the stock which had until then belonged to Schicht. Margarine Unie thus became the sole owner of

the Schicht enterprises. Toward the end of 1929, Margarine Unie and the English concern Lever Brothers Limited exchanged parts of their respective stocks, and the Dutch firm changed its name to Unilever. In 1938, the two concerns merged completely under the name of Lever Brothers and Unilever of London and Rotterdam, with similar managing boards in both countries. Thus, on the eve of the war, the Schicht enterprises in Poland belonged to the English-Dutch fat concern.

The remaining enterprises of the Polish fat industry (oil, soap, and edible fat factories, fat solidifying plants, and similar enterprises) were small and scattered throughout Poland. With few exceptions, these belonged to Polish capital. Since they were broken up into small units, however, they did not represent an economic power comparable to that of the Polish branch of the international Unilever concern. Until 1932, when Unilever built a large oil plant (Union) in Gdynia, its policy was to import finished fat products and tropical oils.

After 1932, this policy was changed to the extent that Unilever imported as large quantities as possible of oleaginous seeds (copra, palm, araceous) from its overseas plantations. There was an opposite tendency represented by Polish agriculture which favored increasing the domestic cultivation and processing of oleaginous plants (flax and rapeseed) and gradually cutting down on the importation of tropical seeds. These two trends were in conflict until the outbreak of the war. Yearly compro-

mise agreements would be reached between the oil manufacturing plants and the Polish planters of oleaginous seeds, assuring the latter a market for their harvests. In 1938, the following quantities of oleaginous seeds were processed in Poland:

	thousand tons
tropical seeds	40.6
imported sunflower seeds and castor-beans	8.3
domestic seeds	76.2
Total	<hr/> 125.1

Artificial Fibers

Until 1939, two important artificial cellulose fiber plants were operating in Poland. Both were owned mostly by foreign capital. The two plants were:

The joint-stock Tomaszow Rayon Factory with a capital of 27 million zlotys.

The joint-stock Chodakow Artificial Weaves and Fabrics Factory with a capital of 15 million zlotys.

The vicissitudes of foreign capital in relation to the Tomaszow factory make an excellent example of how, under capitalist economy, industrial capital can completely change its nationality. The Tomaszow Factory was founded in 1911 by the Bel-

gian Tubise Rayon Factory, on the initiative of the now deceased Feliks Wislicki, who became the director of the enterprise and remained in that position until the outbreak of World War II.

Tubise was not the only stock-holder in the Tomaszow enterprise, in which domestic capital also participated.

In 1925, the well-known Italian concern Snia-Viscosa acquired a controlling interest in the factory. In the thirties, the German concern Glanzstoff started negotiations with the Italian firm for the purpose of taking over the majority of the stock of the Tomaszow factory. These moves were fought by Polish interests, however, and as a result the stock was taken over by an English holding company represented by the Japhet Bank of London. At the outbreak of the war, Polish capital held about 30 percent of the stock of the Tomaszow enterprise.

The Chodakow factory was founded in 1926 by French capital, which remained the actual owner of the enterprise, in spite of the formal transfer of the stock to the Societe Internationale pour L'Industrie des Textiles Artificiels, of Basel, Switzerland. Artificial fibers of the continuous type (rayon) and of the cut type (textra, argona) were produced by the viscose method. The Tomaszow enterprise had the character and aims of a vertical business organization. In addition to the artificial fibers and viscose folia (tomafon), it produced carbon sulfide.

Other Branches of Chemical Technology

In 1937, the Polish State had a foreign debt of 2,205 million zlotys. This included debts owed directly to governments of other countries and securities placed on foreign markets. It is of interest to find out to what extent the foreign credits were guaranteed with the capital of, or revenues from, chemical industrial enterprises owned by the state. It appears that such guarantee was given in connection with the so-called "loan on matches." In 1926, the Polish Match Monopoly was rented for twenty years to a Swedish-American organization set up for this purpose by the Swedish firm of Krueger and Toll A. B. In return, the Polish government received a six million dollar loan, with the revenues from the Match Monopoly serving as security, and an additional sum of money to be used by the State Treasury for buying out private match factories. In 1930, this agreement was revised and a new one was made which was still in effect at the outbreak of the war. According to the new agreement, Poland received a new loan of \$32,400,000 with the simultaneous conversion (konwersja) of the previous loan, the total to be secured by the revenues of the Match Monopoly. One of the provisions of the new agreement waived the requirement that matches be exported from Poland; such a requirement had been included in the 1926 agreement at the desire of the Polish government, but had never been realized in practice. As is well-known, Poland now exports matches.

In connection with this financial operation it should be

mentioned that Swedish capital also bought up the joint-stock enterprise Radocha which produced potassium chloride, indispensable to the manufacture of matches. This enterprise, with its capital of 5,768 million zlotys, was merged with the enterprise organized for the exploitation of the State Match Monopoly.

There were no other direct relations between the government's foreign credits and state-owned chemical industries.

The above review shows that foreign capital played a dominant or very important role in the following branches of chemical industry: soda, sulfuric acid, coal derivatives, intermediate organic products and dyes, pharmaceutical products, fats, artificial fibers, and matches.

On the other hand, domestic capital had a decisive influence in the following branches of production: artificial fertilizers (particularly nitrogen and potassium fertilizers), the processing of wood, bone-glue industry, paints and lacquers, cosmetics, and miscellaneous small chemical industries.

The key positions in the chemical industry were almost exclusively in the hands of foreign capital or under its dominant influence. This circumstance, as well as the general condition of the prewar Polish capitalistic system, resulted in a definite underdevelopment of the chemical industry. The industry was cha-

racterized by an emphasis on the production of raw materials, intermediate products, and simple chemical compounds, and a lack of complicated chemical production units. The production of plastics, for instance, which had made vigorous strides in other countries even before the war, was represented in Poland by only a few of the simplest products, of the celluloid, bakelite, and galalite types. Artificial fibers were produced solely by the viscose method, at a time when elsewhere the acetate and copper-ammonia methods were also achieving great success. These are only a few examples of the backwardness of the prewar industry.

These facts point up the obligations which Polish national economy has in relation to the chemical industry. This industry is a natural production branch for Poland. The Six-Year Plan takes this view, and has expressed it through establishing a solid foundation for the development of a great chemistry in Poland.

The question of how to begin then arises.

On the eve of the war, about 120 relatively large chemical plants were in operation. Their output included about one thousand distinct chemical products. The yearly chemical production value was about 1.5 billion zlotys. 49,000 laborers and 1,200 persons with higher education were employed.

The war, and particularly the several years of enemy occupation, almost completely demolished the results of twenty years' work by the chemical industry in Poland. The entire e-

quipments of many factories, for instance, those of Boruta, Moscice, and Winnica, were removed to Germany.

In 1945, the task of rebuilding Polish industry from its very foundations was undertaken with great enthusiasm and under exceedingly difficult conditions. And what were the results? Let the United Nations European Economic Commission provide the answer. Its data are given below:

The Production Level of the Chemical Industry

Countries	1938=100	Second quarter	1948	Fourth quarter	1947 = 100	
	1947		Third quarter		First quarter	Second quarter
Poland	147	146	146	160	174	169
Belgium	130	107	111	128	121	122
Czechoslovakia	102	120	117	132	127	132
France	110	128	110	111	118	122
Holland	83	129	125	131	134	130
West Germany	30	134	168	186	205	213
Italy	85	112	125	116	108	120
Great Britain	151	113	110	118	118	120

Summary

Conditions of development of the chemical industry in Poland before World War I and in the period between the two wars. The foreign capital in the Polish chemical industry and its role

in the production of soda, sulfuric acid, distillation of coal tar, dyes, pharmaceuticals, fats and oils, artificial fibers, and matches. The position of the chemical industry after World War II and at present.

Bibliography

1. Annuaire Statistique de la Ste des Nations, 1940/41, Geneva, 1941.
- ⁵
2. The Mineral Industry of the British Empire and Foreign Countries, Imperial Institute, London, 1939.
- ⁴
3. Maly Rocznik Statystyczny 1938 (Statistical Yearbook for 1938), Warsaw, 1938.
2. Economic Bulletin for Europe, No 3, 1949, United Nations, Geneva, 1950.
7. Rocznik Polskiego Przemyslu i Handlu (Yearbook of Polish Industry and Commerce), Warsaw, 1936.
9. L. Wellisz, Foreign Capital in Poland, London, 1938.
3. Informator Chemiczny (Chemical Informer), Warsaw, 1931.
8. XVIII Sprawozdanie Związku Przemyslu Chemicznego R. P. (XVIII Report of the Association of Chemical Industry of the Polish Republic), Warsaw, 1939.
6. Przemysl Chemiczny (Chemical Industry), 1945/1949.